DEPARTMENT OF THE NAVY
NAVAL AIR SYSTEMS COMMAND
NAVAL AIR SYSTEMS COMMAND HEADQUARTERS
WASHINGTON, DC 20361 -7140

IN REPLY REFER TO
NAVAIRINST 5230.13
AIR-714C

<u>NAVAIR INSTRUCTION 5230.13</u>

From: Commander, Naval Air Systems Command

Subj: NAVAL AIR SYSTEMS COMMAND HEADQUARTERS NETWORK (NHN)
INTERNAL CONNECTIVITY AND INTERFACE CONTROL POLICY

Encl: (1) NHN Internal Connectivity Guide
(2) NHN Interface Control Document

1. <u>Purpose</u>. To establish a comprehensive policy regarding
internal and external systems connectivity and interface control
on the Naval Air Systems Command Headquarters (NAVAIRHQ) Network
(NHN) for the Naval Aviation Systems Team (TEAM), which is
comprised of: NAVAIRHQ; the naval aviation Program Executive
Offices (PEOs) for: Air Anti-Submarine Warfare, Assault and
Special Mission Programs; Cruise Missiles Project and Unmanned
Aerial Vehicles Joint Project; and Tactical Aircraft Programs;
the Direct Reporting Program Office (AX); and the Naval Air
Warfare Center Headquarters (NAWCHQ).

2. <u>Background</u>. The NHN initiative currently underway will
provide an integrated data communications network that will
extend the capabilities of accessing, manipulating and sharing
naval aviation data TEAM-wide. Therefore, it is imperative that
no deviations occur from the prescribed network operating system
and applications selected for internal NHN usage. It is
mandatory that new information systems (ISs) adhere to the
policies outlined in enclosures (1) and (2) to ensure that
information will be readily transportable between information
processing systems.

3. <u>Scope</u>. The provisions of this instruction apply to any
organization linking to or interoperating with the NHN. This
instruction provides guidance for internal and external systems
development and integration on the NHN.

4. <u>Definitions</u>

a. <u>Compatibility</u>. The property of systems that allows the
exchange of necessary information directly and in usable form.
This implies use of identical or compatible protocols.

b. __Interoperability__. The ability to provide services to and accept services from other systems or units and to use the services so exchanged to enable them to operate effectively and transparently together.

5. __Policy__. NHN data communications are operated, maintained and managed by the Information Systems Technologies Division (AIR-714). NHN is planned, managed and supported to provide maximum long-term effectiveness, compatibility and interoperability. The NHN was implemented to ensure the cost-effective availability of information resource capabilities required to support the TEAM's mission. Therefore, all internal and external users wishing to implement connectivity with NHN will adhere to the policies outlined in enclosures (1) and (2).

6. __Responsibilities__

a. __AIR-714__ will monitor the network and enforce the policy outlined in enclosures (1) and (2). AIR-714 will also be responsible for the configuration management of NHN, including:
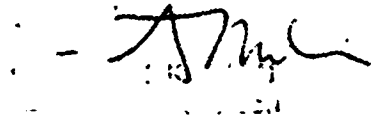
(1) Defining system interface and architecture standards and software communications protocols for NHN and those external networks interfacing to NHN.

(2) Operating and maintaining NHN.

(3) Providing system engineering support to the program office developing the application.

(4) Establishing and maintaining communications configuration management databases and change control procedures that track both hardware configurations and software release levels for NHN.

b. __End-users__ will be responsible for notification of and coordination with AIR-714 of new system development and integration requirements prior to occurrence. Users are responsible for informing AIR-714 of their communications requirements and problems in a timely manner. Users are also responsible for any costs incurred for NHN restoration due to violation of the provisions of this instruction. Any request to modify, or in any way interface with the NHN must be done so with the approval of AIR-714.

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NHN INTERNAL CONNECTIVITY GUIDE

1. BACKGROUND

The NHN is designed to provide its users with a wide range of services. As initially installed, the NHN will provide file and printer sharing, electronic mail, file transfer, virtual terminal, dial-out, and data base access capability to each of its users. As the needs of the user community grow, there will be situations where the services provided by the NHN must be expanded. This expansion must be accomplished in an orderly fashion so that service to ALL users is maintained. This document is intended to be a guide to system developers and integrators who wish to use the NHN as a mechanism to support their networked applications.

2. SCOPE

The scope of this document is NHN-wide. The NHN is defined as the network which connects the TEAM (i.e., NAVAIRHQ, the PEOs, and NAWCHQ). This document assumes that the NHN internal configuration is homogeneous. There will be no deviations from the prescribed network operating system (NOS) and applications selected for internal NHN use. This document specifically addresses internal connectivity within the NHN homogeneous network. Any application developed for use on the NHN will adhere to this guide. Plans for developing applications for use on the NHN shall be approved by AIR-714.

3. OPEN SYSTEMS INTERCONNECT (OSI) MODEL

This document is organized along the lines of the International Standards Organization (ISO) recommended network model called the OSI. If required, each layer includes specific interface requirements. The application developer will provide applications which interface with the native application programming interfaces (APIs) provided on the network node at the appropriate layer of the model. The application developer will not interfere with the normal operation of the node by introducing replacements for any of the layers provided natively on the node. For example, an application developer will not substitute the LANTASTIC NOS for use on a network node to implement an application.

The application developer will be allowed to interface with the APIs provided on the network node, regardless of type of node, assuming that CPU, memory, storage and input/output bandwidth are available on the node. Figure (1) depicts the environment that application developers and integrators are permitted to operate within.

NHN INTERNAL CONNECTIVITY

FILE/PRINT/MAIL SERVER

ORACLE SQL SERVER

NHN

X.400,X.500,DDS,FTAM,DAP,VT...
X11,R4/MOTIF/SQL
SMB/NETBIOS
LAST/TP4
DECNET/OSIATK/LAD

ISO 8802-3/FDDI
UTP/FIBER

UTP

ISO 8802-3

DECNET/OSILAD
LAST/TP4
SMB/NETBIOS
X11,R4/MOTIF/SQL
X.400,X.500,DDS,FTAM,DAP,VT...

UTP

ISO 8802-3

DECNET/OSIATK/LAD

LAST/TP4

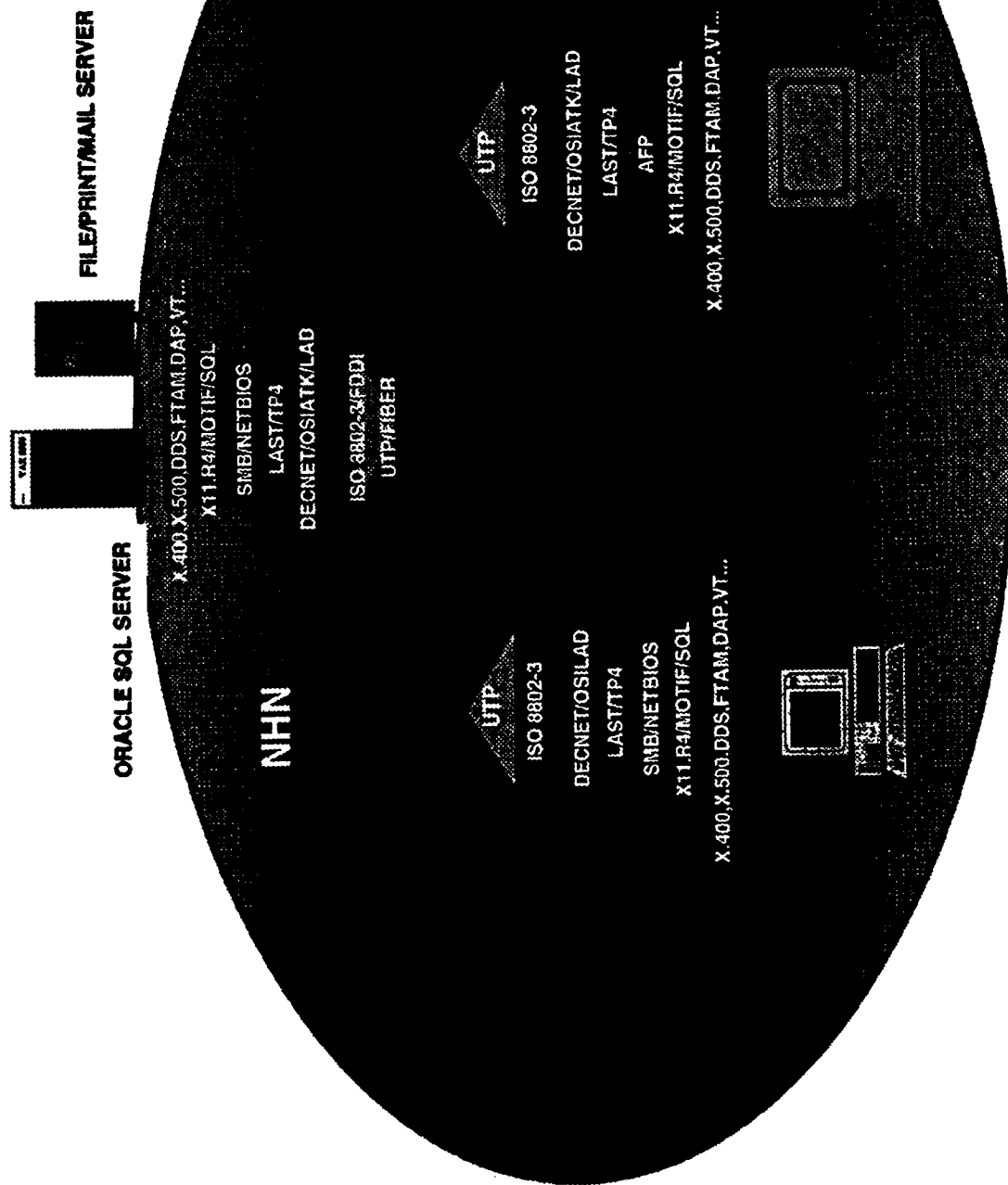AFP

X11,R4/MOTIF/SQL

X.400,X.500,DDS,FTAM,DAP,VT...

Figure (1)

NOTE: Not all services are offered over all protocols

3.1 PHYSICAL

Nodes connecting to the NHN will utilize ISO 8802-3 (10 BASET) ports. **No other connection media is authorized.** There may be situations where direct connection **may** be authorized; however, these applications must demonstrate the need for the higher bandwidth offered by the NHN Fiber Distributed Data Interface (FDDI) backbone.

3.2 DATALINK

NHN nodes will conform to the ISO 8802-3 datalink protocols. **No other data link protocol is authorized.** There **may** be situations where applications require the high bandwidth offered by a direct connection to the NHN FDDI backbone. In these cases, the FDDI datalink **is** permissible.

3.3 NETWORK

Internal NHN users will have a wide range of protocols available. The specific protocols permitted on the network node depend on the node type and the applications supported by the node. As a general rule, the NHN core protocols *(APPLETALK, DECNET and OSI)* are the only permitted protocols on a network node. There may be cases where other protocols will be permitted. These exceptions and conditions for use are further defined.

3.3.1 DECNET

The DECNET protocol shall be available on every NHN network node including Macintosh, DOS/Windows and Server platforms. DECNET will eventually be phased out in favor of the OSI protocol.

3.3.2 APPLETALK

APPLETALK shall be available on every NHN Macintosh type network node. The NHN file, application and data base servers shall also support APPLETALK.

3.3.3 XEROX NETWORK SERVICES (XNS)

XNS will be available on certain NHN nodes to support interoperability with 3COM specific applications for which no gateway or supported substitute exists. XNS will also be permitted on network nodes during the transition from 3+ Share NOS to the Pathworks NOS.

3.3.3.1 CONDITIONS FOR USE

XNS will be permitted for use by network nodes if the protocol is required to support 3COM specific applications for which no gateway or substitute exists. Examples of such applications include data base servers designed to work specifically with 3COM 3+ Share servers. If the node requires access to a 3+ Share resource **OUTSIDE** the NHN and if a direct link to that resource exists, XNS will be permitted to exist on the node as an unsupported protocol. AIR-714 encourages migration from XNS to a supported protocol as soon as practicable. Access to 3+ Mail and NETBIOS is not sufficient reason to allow support for XNS on a network node because gateways and substitutes for these applications exist in the new NOS. Pathworks/3COM coexistence is the only XNS protocol driver which will be used on NHN nodes requiring NHN compatability.

3.3.4 INTERNET PACKAGE EXCHANGE (IPX)

IPX will be available on certain NHN nodes to support interoperability with NETWARE specific applications for which no gateway or supported substitute exists. IPX will also be permitted on network nodes during the transition from NETWARE to the Pathworks NOS.

3.3.4.1 CONDITIONS FOR USE

IPX will be available to support certain NETWARE applications for which no gateway or substitute exists. Examples of such applications include services which were offered to NETWARE networks which predate the installation of the Pathworks NOS. New applications will not use IP as a transport protocol. If the node requires access to a NETWARE resource **OUTSIDE** the NHN and if a direct link to that resource exists, IPX will be permitted to exist on the node as an unsupported protocol. AIR-714 encourages migration from IPX to a supported protocol as soon as practicable. Pathworks/NETWARE coexistence is the only IPX protocol driver which shall be used on NHN nodes requiring IPX compatability.

3.3.5 INTERNET PROTOCOL (IP)

IP will be available on certain NHN nodes to support interoperability with TCP/IP specific applications for which no gateway or supported substitute exists.

3.3.5.1 CONDITIONS FOR USE

IP will be available to support certain TCP/IP applications for which no gateway or substitute exists. NHN specific applications will not use IP as a transport protocol. If the node requires access to a TCP/IP resource **OUTSIDE** the NHN and if a direct link to that resource exists, IP will be permitted to exist on the node as an unsupported protocol. AIR-714 encourages migration from IP to a supported protocol as soon as practicable. Pathworks TCP/IP is the only IP protocol driver which shall be used on NHN nodes requiring IP compatability.

3.3.6 LAD

The LAD protocol will be available on certain NHN nodes to support interoperability with LAD specific applications such as CD-ROM.

3.3.6.1 CONDITIONS FOR USE

LAD will be installed on any network node which requires access to the NHN provided networked CD-ROM services. No substitute protocol will be permitted for use as a CD-ROM access protocol on the NHN.

3.3.7 OSI

OSI will ultimately be available on every NHN node. It is the intention of AIR-714 to migrate the NHN to an entirely OSI environment by June 1996. New application developments will factor the migration to OSI into the development effort.

3.4 TRANSPORT

3.4.1 TP4

The TP4 transport will ultimately be available for use on all NHN workstation platforms. Applications designers who require direct access to the transport layer shall not preclude the use of TP4 and shall actively pursue support of it.

3.4.2 LOCAL AREA SYSTEMS TRANSPORT (LAST)

LAST shall be used exclusively for file and printer sharing by DOS/WINDOWS workstations.

3.5 SESSION

3.5.1 SMB (MICROSOFT LAN MANAGER FILE PROTOCOL)

The Server Message Block (SMB) protocol will be used exclusively for file and printer sharing by DOS/WINDOWS workstations.

3.5.2 AFP (APPLE FILE PROTOCOL)

AFP will be used exclusively for file and printer sharing by Macintosh workstations.

3.5.3 NETWORK BASIC INPUT/OUTPUT SERVICES (NETBIOS)

NETBIOS over the DECNET and OSI protocols will be the only NETBIOS variant permitted on the NHN. NETBIOS based applications will be permitted providing they will correctly operate over the NHN core protocols and have been approved by AIR-714. Support for NETBIOS over other NHN protocols (TCP/IP and IPX) may be provided if the criteria for using those protocols has been met and NETBIOS is required. AIR-714 will approve all requests using NETBIOS over any protocol other than the NHN core protocols.

3.5.4 NCP (NOVELL NETWARE FILE PROTOCOL)

The NETWARE Core Protocol (NCP) will be provided to those workstations which meet the use criteria for the IPX protocol. Requests for using NCP must be approved by AIR-714 prior to installation. NCP will be considered an unsupported protocol.

3.6 PRESENTATION

3.6.1 X-WINDOWS

The X-Windows (X.11.R4)/Motif Graphical User Interface (GUI) shall be available on all NHN workstations. X-Windows shall be supported over the NHN core protocols and TCP/IP. TCP/IP support will only be provided if the use criteria for the IP networking protocol has been satisfied for the workstation.

3.6.2 STRUCTURED QUERY LANGUAGE (SQL) APPLICATION PROGRAMMING INTERFACE (API)

The SQL API provided by the Oracle SQL-NET product will be available for use on NHN workstations. SQL support will not be provided on every workstation. Specific SQL requirements will be handled on a case-by-case basis by AIR-714. The NHN will only support SQL via Oracle SQL-NET.

Enclosure (1)

3.7   APPLICATION

The NHN will support a wide range of network applications. Network applications are those which use the network to share information. Applications which use the network to store the application executable files are not within the scope of this document.

3.7.1   MESSAGING

The NHN will support an X.400 standards based messaging system. No other messaging system will be directly supported by the NHN. Gateways to other messaging systems may be provided if sufficient user demand exists.

3.7.1.1   INITIALLY DEPLOYED ARCHITECTURE

AIR-714's initial messaging architecture is based on the Team Link's and MailBus products developed by Digital Equipment Corporation. The MailBus product provides the X.400 (1988) Message Transfer Agent (MTA). The Team Link's product provides the X.400 User Agent (UA). As intially installed, NHN workstations will have access to the messaging system via the Pathworks provided Team Links user interface. Figure (2) pictorially shows the initial architecture of the messaging system.

3.7.1.2   SUPPORT FOR ALTERNATIVE USER INTERFACE

As the Team Links product evolves support for industry, standard APIs (MAPI, OCE, XAPI) will become available. User interfaces from other electronic mail software packages which can take advantage of these APIs may be substituted for the Team Links user interface. Certain features which are only available to X.400 users may not be available to some of these substitute user interfaces. It is the intention of AIR-714 to support alternative user interfaces to the extent that these user interfaces can take advantage of the NHN MTAs via the APIs available on the workstations.

3.7.1.3   SIMPLE MAIL TRANSFER PROTOCOL (SMTP)

The NHN will provide a bi-directional gateway to SMTP based electronic messaging systems. The gateway will only be used to communicate with SMTP based messaging servers located outside of the NHN.

Enclosure (1)

NHN INTERNAL ELECTRONIC MESSAGING CONNECTIVITY

X.400 MTA/DDS/X.500

XAPI

XAPI
VIM MAPI OCE
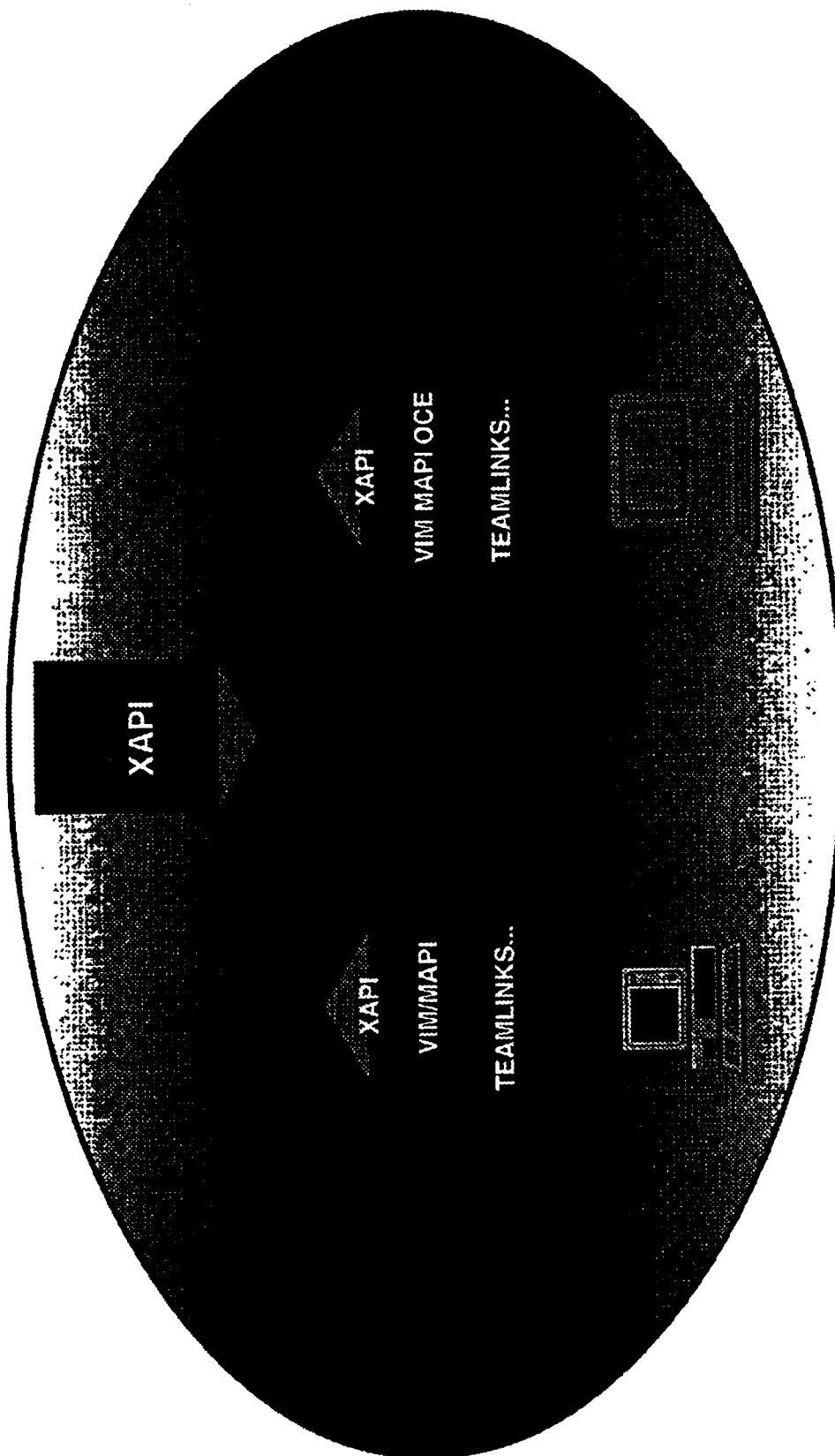TEAMLINKS...

XAPI
VIM/MAPI
TEAMLINKS...

Figure (2)

3.7.1.4 cc:MAIL

The NHN will provide a bi-directional gateway to cc:MAIL based electronic messaging systems. This gateway will be provided only during the transition period while the Naval Air Systems Team is migrating to the X.400 messaging standard. The cc:MAIL gateway will provide directory synchronization with other cc:MAIL networks if applicable. The gateway will only be used to communicate with cc:MAIL based messaging servers located <u>outside</u> of the NHN.

3.7.1.5 MICROSOFT MAIL

The NHN will provide a bi-directional gateway to Microsoft Mail based electronic messaging systems. This gateway will be provided only during the transition period while the Naval Air Systems Team is migrating to the X.400 messaging standard. The Microsoft Mail gateway will provide directory synchronization with other Microsoft Mail networks if applicable. The gateway will only be used to communicate with Microsoft Mail based messaging servers located <u>outside</u> of the NHN.

3.7.1.6 3+MAIL

The NHN will provide a bi-directional gateway to 3+Mail based electronic messaging systems. This gateway will be provided only during the transition period while the Naval Air Systems Team is migrating to the X.400 messaging standard. The gateway will only be used to communicate with 3+Mail based messaging servers located outside of the NHN.

3.7.1.7 DEFENSE MESSAGING SYSTEM (DMS)

The NHN will provide electronic delivery of unclassified Naval Messages from the DMS.

3.7.2 DIRECTORY SERVICES

The NHN directory service will provide each user the following information: First Name, Middle Initial, Last Name, Generation, Formal Title, Organizational Unit, Job Title, Telephone Number, Telephone Extension, Building Name and Room Number.

3.7.2.1 DISTRIBUTED DIRECTORY SERVICE (DDS)

The DDS, provided as part of the Pathworks NOS, will be the only directory service used for network applications.

3.7.2.2 X.500

It is the intention of AIR-714 to migrate the NHN to a standards based environment. When this occurs, the X.500 directory service will be the only directory service used for network applications.

3.7.3 VIRTUAL TERMINAL (VT) SESSIONS

The NHN will provide VT services from every workstation located on the network. The terminal service will emulate a VT-320 terminal.

3.7.3.1 LOCAL AREA TRANSPORT (LAT) PROTOCOL SUPPORT

Every NHN workstation will have terminal access to corporate VAX assets via the LAT protocol.

3.7.3.2 COMMAND TERMINAL (CTERM) PROTOCOL

Every NHN workstation will have terminal access to corporate VAX assets via the CTERM protocol. CTERM will also allow access to corporate VAX assets outside of the NHN provided physical connectivity assets.

3.7.3.3 OSI VIRTUAL TERMINAL (VT) PROTOCOL

OSI VT services will be provided to every NHN workstation. OSI VT support will allow access to remote OSI VT hosts providing physical connectivity assets.

3.7.3.4 TELNET PROTOCOL

TELNET services will be provided to every workstation on the NHN which supports the LAT protocol via a LAT/TELNET application gateway. Native TELNET services will be provided to those workstations which meet the use criteria for the IP Network Layer protocol.

3.7.3.5 DIAL-OUT

Dial-out Terminal Services will be provided via the LAT protocol and LAT-based communications servers located on the NHN.

3.7.4 FILE TRANSFER SESSIONS

The NHN will provide file transfer applications independent of the File Sharing capability mentioned in the Session Layer.

3.7.4.1 DATA ACCESS PROTOCOL (DAP)

The DAP will be available to NHN users wishing to transfer files between other workstations, servers, or other DECNET based hosts, either directly connected to the NHN or over the Wide Area.

3.7.4.2 FILE TRANSFER PROTOCOL (FTP)

The NHN will provide FTP services to every NHN workstation via the FTP/FTAM/DAP application gateway. Native FTP services will be provided to those workstations which meet the use criteria for the IP Network Layer Protocol.

3.7.4.3 OSI FILE TRANSFER ACCESS MANAGEMENT (FTAM)

OSI FTAM will ultimately be provided to every NHN workstation. In the interim, every NHN workstation will have access to OSI FTAM via the FTP/DAP/FTAM application gateway.

3.7.5 DATABASE ACCESS

The NHN will provide database access to selected workstations. The databases will be corporate and local in nature. All databases in use on the NHN will be queryable via SQL.

3.7.5.1 CORPORATE

NHN corporate databases will be resident on Oracle Database Servers. All data will be accessed from the corporate databases via Oracle SQL-NET.

3.7.5.2 LOCAL

TBD

3.7.6 APPLICATION GATEWAYS

The NHN will provide gateways to assist in the migration from the existing proprietary environment to one on Open Systems. The NHN will initially provide the following application gateways:

3.7.6.1 VIRTUAL TERMINAL (VT)

The NHN will support a bi-directional gateway between the LAT, TELNET and OSI VT protocols.

3.7.6.2 FILE TRANSFER

The NHN will support a bi-directional gateway between the DAP, FTP and FTAM protocols.

3.7.6.3 ELECTRONIC MESSAGING

The NHN will support bi-directional electronic mail gateways to non-X.400 electronic messaging systems outside of the NHN.

3.7.6.3.1 cc:MAIL

The NHN cc:MAIL Gateway will be Digital Postmaster supporting full directory synchronization.

3.7.6.3.2 MICROSOFT MAIL

The NHN Microsoft Mail Gateway will be Digital Postmaster supporting full directory synchronization.

3.7.6.3.3 3+MAIL

The NHN 3+Mail gateway will be MBLINK developed by AAC.

3.7.6.3.4 SMTP

The NHN SMTP gateway will be the Woolongong SMTP to Message Router gateway.

3.7.7 CD-ROM ACCESS

CD-ROM support will be provided to every NHN workstation if required. CD-ROMs for general use will be made available on InfoServer CD-ROM controllers and accessible via the LAD protocol. On-line CD-ROM services for general use will include:

TBD

NHN INTERFACE CONTROL DOCUMENT (ICD)

1. SCOPE

The scope of this document is TEAM-wide. It is intended to provide systems development policy to any organization linked to or interoperating with the NHN. The NHN is defined as the network which connects the TEAM (i.e., NAVAIRHQ, the PEOs, and NAWCHQ). This document assumes that the NHN internal configuration is homogeneous. There will be no deviations from the prescribed network operating system (NOS) and applications selected for internal NHN use. This document specifically addresses internal connectivity within the NHN homogeneous network.

The document is intended to provide guidance on what the eventual NHN interoperability configuration will be. It is intended to be an implementation plan for external NHN users wishing to implement connectivity with the NHN. AIR-714 realizes that in order to effecuate a design conforming the connectivity requirements outlined in this ICD, certain schedule information should be provided. Appendix A contains a list of supported protocols and services and associated availability schedules. Figure (1) pictorially shows NHN connectivity when the NHN NOS is fully installed. Figure (2) pictorially shows NHN connectivity when the NHN is migrated to a fully OSI environment.

2. OPEN SYSTEMS INTERCONNECT (OSI) MODEL

The ICD is organized along the lines of the ISO recommended network model called the OSI. We have intentionally ignored layer one because it typically does not relate to wide-area network discussions. The discussion begins at layer two because it is the layer at which wide area networking begins to become appropriate.

2.1 DATALINK

The NHN will not support bridging to external networks except where there is a demonstrated exceptional need. Routable protocols will be routed and not bridged. Non-routable protocols may be bridged provided adequate safeguards are provided at both ends of the circuit. Requests for bridging of non-routable protocols will be handled on a case-by-case basis by AIR-714. The ISO 8802-1 Spanning Tree standard will be utilized in cases where bridging of non-routable protocols is allowed.
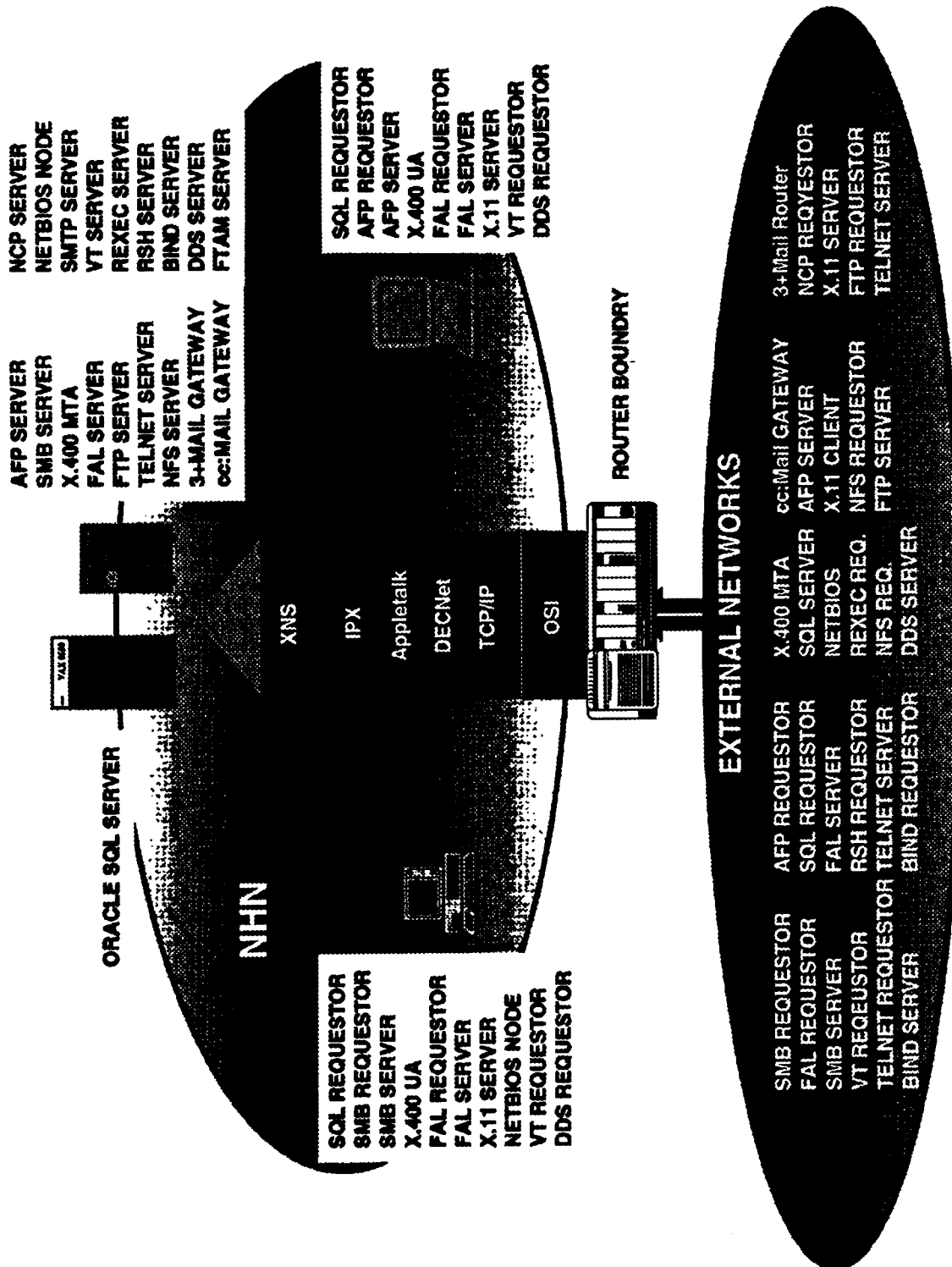
INITIAL NHN EXTERNAL CONNECTIVITY

NHN

ORACLE SQL SERVER

XNS
IPX
Appletalk
DECNet
TCP/IP
OSI

AFP SERVER
SMB SERVER
X.400 MTA
FAL SERVER
FTP SERVER
TELNET SERVER
NFS SERVER
3+MAIL GATEWAY
cc:MAIL GATEWAY

NCP SERVER
NETBIOS NODE
SMTP SERVER
VT SERVER
REXEC SERVER
RSH SERVER
BIND SERVER
DDS SERVER
FTAM SERVER

SQL REQUESTOR
SMB REQUESTOR
SMB SERVER
X.400 UA
FAL REQUESTOR
FAL SERVER
X.11 SERVER
NETBIOS NODE
VT REQEUSTOR
DDS REQUESTOR

SQL REQUESTOR
AFP REQUESTOR
AFP SERVER
X.400 UA
FAL REQUESTOR
FAL SERVER
X.11 SERVER
VT REQUESTOR
DDS REQUESTOR

ROUTER BOUNDRY

EXTERNAL NETWORKS

SMB REQUESTOR
FAL REQUESTOR
SMB SERVER
VT REQEUSTOR
TELNET REQUESTOR
BIND SERVER

AFP REQUESTOR
SQL REQUESTOR
FAL SERVER
RSH REQUESTOR
TELNET SERVER
BIND REQUESTOR

X.400 MTA
SQL SERVER
NETBIOS
REXEC REQ.
NFS REQ.
DDS SERVER

cc:Mail GATEWAY
AFP SERVER
X.11 CLIENT
NFS REQUESTOR
FTP SERVER

3+Mail Router
NCP REQYESTOR
X.11 SERVER
FTP REQUESTOR
TELNET SERVER

NOTE: Not all services are offered over all protocols

Figure (1)

FINAL NHN EXTERNAL CONNECTIVITY

ORACLE SQL SERVER

AFP SERVER
SMB SERVER
X.400 MTA
FAL SERVER
FTP SERVER
TELNET SERVER
NFS SERVER
X.500 SERVER

NETBIOS NODE
SMTP SERVER
VT SERVER
REXEC SERVER
RSH SERVER
BIND SERVER
FTAM SERVER

NHN

Appletalk
DECNet
TCP/IP
OSI

SQL REQUESTOR
SMB REQUESTOR
SMB SERVER
X.400 UA
FAL REQUESTOR
FAL SERVER
X.11 SERVER
NETBIOS NODE
VT REQUESTOR
X.500REQUESTOR
FTAM REQUESTOR

SQL REQUESTOR
AFP REQUESTOR
AFP SERVER
X.400 UA
FAL REQUESTOR
FAL SERVER
X.11 SERVER
VT REQUESTOR
X.500 REQUESTOR
FTAM REQUESTOR

ROUTER BOUNDRY
WITH INTEGRATED
IS-IS

EXTERNAL NETWORKS

SMB REQUESTOR
FAL REQUESTOR
SMB SERVER
VT REQUESTOR
TELNET REQUESTOR
BIND SERVER

AFP REQUESTOR
SQL REQUESTOR
FAL SERVER
RSH REQUESTOR
TELNET SERVER
BIND REQUESTOR

X.400 MTA
SQL SERVER
NETBIOS
REXEC REQ.
NFS REQ.

X.500 SERVER
AFP SERVER
X.11 CLIENT
NFS REQUESTOR
FTP SERVER

X.11 SERVER
FTP REQUESTOR
TELNET SERVER

NOTE: Not all services are offered over all protocols

Figure (2)

2.2 NETWORK

The NHN supports a variety of network layer protocols. The environment is designed to support both proprietary and open network layer standards. The TEAM goal, however, is to migrate away from the proprietary standards in favor of the open standards. Specifically, OSI will ultimately be the only networking protocol supported across the entire TEAM. Organizations will utilize this document to justify and guide the upgrade and installation of new and upgraded systems across the TEAM.

2.2.1 ROUTER TECHNOLOGY

The NHN is designed to support open standards where possible. Unfortunately, multiprotocol routers typically do not support a standards-based internetwork routing protocol. It is the intention of the TEAM to support routing technology which supports standards-based internetworking protocols. While the standards evolve, the NHN will utilize a single proprietary router which will migrate to the standards-based protocol. Organizations wishing to internetwork with the NHN will use the 3COM Netbuilder II series of routers unless alternate solutions are approved by AIR-714.

2.2.2 PROPRIETARY ROUTING PROTOCOL SUPPORT

It is understood that the adoption of OSI as a networking standard within the Navy will take some time. During the transition, proprietary protocols will exist and will have to be interfaced to the NHN. It is the intent of this document to provide the interface criteria for certain popular proprietary protocols.

2.2.2.1 DECNET

DECNet will be the primary proprietary routing protocol used by the NHN during the transition to OSI. DECNet requires that unique addresses be assigned to each node. The address is of the form $XX.YYYY$ where XX is the area number and $YYYY$ is the node number. The DECNet area values may range between *1 and 63* and the node number values may range between *1 and 1023*. The NHN implementation reserves areas *57 through 63* for internal use. The other areas are assigned by AIR-714 for the entire TEAM. Each TEAM activity is assigned one or more areas to prevent address conflicts. Sites wishing to integrate their DECNet network with the NHN must coordinate with AIR-714 to get the appropriate area assignment. Appendix B shows the currently approved TEAM DECNet addressing assignments. The choice of area values in the upper range allows the NHN to participate in a DECNET network as a hidden area. Sites which

wish to interface with the NHN, but do not wish to reassign their internal areas, may do so provided they treat the NHN as a hidden area. The DECNet will be routed to and from NHN.

2.2.2.2 APPLETALK

Appletalk is the primary protocol used by Macintosh computer systems. The NHN and the TEAM have a large installed base of Macintosh computer systems. The Appletalk network will be supported by the NHN internally and externally. Appletalk uses the concept of zones and zone numbers to uniquely identify logical networks. The NHN currently reserves the range of network numbers of *20000 - 21999*. AIR-714 will assign network ranges to other networks as required. See Appendix C for currently assigned network ranges used by the TEAM. The ARUP variant of the Appletalk protocol will be routed to and from the NHN.

2.2.2.3 XEROX NETWORK SERVICES (XNS)

The XNS network will be supported by the NHN to maintain backwards compatability with 3+ Mail. The intention is to provide compatability with existing 3+ networks interfacing with the NHN. There is no intention to provide 3+ network links to the new networks. See Appendix A concerning the scheduled phase-out of XNS. The XNS network which will be provided for external interface is network *5277B*. The XNS protocol will be routed to and from the NHN.

2.2.2.4 INTERNET PACKAGE EXCHANGE (IPX)

The IPX protocol is used primarily by the Netware NOS. IPX will be provided to interface the NHN Netware networks for file and print sharing services only. The IPX network which will be provided for external interface is network *100BB*. The IPX protocol will be routed to and from the NHN.

2.2.2.5 INTERNET PROTOCOL (IP) SUPPORT

The IP will be supported by the NHN through routers logically connected to the NHN Class B network. The Class B network assignment for NHN is *160.107.0.0*. IP will be utilized by each of the NHN file servers and a limited number of NHN clients. IP address coordination throughout the TEAM will be done through the INTERNET Network Information Center (NIC). Only NIC recognized IP networks will connect with the NHN. IP will be routed to and from the NHN using the TBD (RIP, BGP or OSFP) routing protocol.

2.2.2.6 OSI SUPPORT

The NHN will ultimately provide end-to-end OSI support. The NHN will be assigned a routing domain for incorporation into the local NSAP addresses. The routing domain will be assigned by DISA for the entire Crystal City area. AIR-714 will maintain the LOCAL AREA assignments for the Crystal City routing domain. External organizations will obtain valid routing domain assignments from DISA. Networks with private routing domain assignments (AFI=49) will not be allowed to interoperate with the NHN. The routing domain which will be made available for external connection is 010C. LOCAL AREA assignments from 00-01 through 00-45 are reserved for the NHN. The full NSAP for the NHN up to and including our internal routing domain is 47 000700 0000 010C. The NHN will support OSI routing over the MILNET. OSI will be **routed** to and from the NHN using the ISO defined IS-IS protocol.

2.2.2.6.1 MIGRATION FROM PROPRIETARY ROUTING AND IP PROTOCOLS TO OSI

It is the intention of the TEAM to migrate from proprietary routing protocols and IP to a fully OSI compliant network. At that time, proprietary routing protocols will no longer be supported by the NHN. Sites wishing to interoperate with the NHN will use OSI as the primary routing protocol. IP will continue to be supported to provide access to the INTERNET and other DoD networks.

2.3 TRANSPORT

The transport layer will rely on the network layer for network connection services. Proprietary session layer services will be supported for the IPX, Appletalk, DECNet and XNS protocols until the NHN transition to a fully OSI compliant network. At that time, the OSI transport layer services will be used to interoperate with the NHN.

2.3.1 OSI TRANSPORT SUPPORT

The NHN will simultaneously support the OSI transports called out in GOSIP V2.0 including TP0 and TP4. GOSIP V3.0 will be supported when approved.

2.4 SESSION

The NHN supports session layer services. Proprietary session layer services are permissible, but will be replaced by OSI session layer services. The session layer will rely on the transport layer for network connection services except where noted.

Enclosure (2)

2.4.1 PROPRIETARY SESSION SUPPORT

Proprietary session layers will be supported by the NHN for backwards compatibility with Novell Netware, 3COM 3+ SHARE and Microsoft LAN Manager.

2.4.1.1 SERVER MESSAGE BLOCK (SMB) SUPPORT

SMB session layer services will be supported by the NHN for file and print sharing. The capability will exist to provide remote SMB services via XNS, DECNet and TCP/IP protocols.

2.4.1.1.1 INTEROPERABILITY WITH 3COM 3+ SHARE

The NHN will provide limited SMB services for 3COM 3+ SHARE networks. Support will be for selected internal NHN clients to outside 3COM networks. 3+ SHARE network services will not be integrated into future NHN servers. External 3+ SHARE file and print connection requests will not be supported.

2.4.1.1.2 INTEROPERABILITY WITH LAN MANAGER

The NHN will provide SMB services for Microsoft LAN MANAGER networks. Support will be for both internal and external clients.

2.4.1.1.3 INTEROPERABILITY WITH NOVELL NETWARE

The NHN will provide file and printer sharing services for Novell NETWARE networks. Support will be for both internal and external clients over the IPX protocol. It is not the intention of the NHN to provide duplicate services for the standard NHN NOS and NETWARE. NETWARE services will be provided on a limited basis to selected internal customers who have no other standards-based communications options. AIR-714 will assess NETWARE interoperability requirements on a case-by-case basis.

2.4.1.2 APPLE FILE PROTOCOL (AFP) SUPPORT

AFP support will be provided. Support will be for both internal and external Macintosh clients over the Appletalk network protocol.

2.4.1.3 NETWORK BASIC INPUT/OUTPUT SERVICES (NETBIOS) SUPPORT

NETBIOS services will be provided. Support will be for both internal and external clients over the DECNet and TCP/IP protocols. ISO NETBIOS will replace the proprietary NETBIOS.

2.4.1.4 OSI SESSION SUPPORT

The NHN will support OSI Session protocols as specified in the GOSIP V2.0 document.

2.5 PRESENTATION

The NHN provides presentation layer services. The presentation layer will utilize the session layer for network connection services.

2.5.1 X-WINDOWS SUPPORT

The NHN will support X-Windows/Motif capability for all internal clients to facilitate outbound X-Windows connections. Certain NHN applications will be developed to support X-Windows GUI and will be made available for external clients to use. X-Windows applications will be made available via TCP/IP, DECNet, Appletalk and OSI protocols.

2.6 APPLICATION

The NHN provides application layer services. The application layer will use the presentation layer for all network connection services.

2.6.1 X.400 ELECTRONIC MAIL

The primary messaging service will be X.400 based. The NHN will accept electronic mail only through X.400. Internally, the NHN will provide X.400 User Agents for Windows, Macintosh, Virtual Terminal and X-Windows workstations. External sites wishing to communicate with the NHN will use X.400 Message Transfer Agent over the OSI protocol stack.

2.6.1.1 SUPPORT FOR X.400 1984 STANDARD

The NHN will initially be configured to support the X.400 1984 standard. It is the goal of the NHN to support the X.400 1988 standard.

2.6.1.1.1 DIRECTORY SERVICE SUPPORT

A directory service will be provided by the NHN to facilitate the use of the X.400 messaging system.

2.6.1.1.1.1 PROPRIETARY

The NHN will support the Distributed Directory Service (DDS) as its sole directory service prior to the migration to X.500. The DDS master node will be resident on the NHN. DDS node numbers will be assigned by AIR-714 to ensure that no conflicts exist.

2.6.1.1.1.2 MIGRATION TO X.500

It is the intention of the TEAM to migrate the proprietary directory service, DDS, to the X.500 standard by July 1995.

2.6.1.2 SIMPLE MAIL TRANSPORT PROTOCOL (SMTP) ELECTRONIC MAIL

The SMTP will be supported by the NHN. All internal NHN clients will have the capability to send and receive SMTP messages over the INTERNET.

2.6.1.3 3+ MAIL

3+ Mail for internal use will be supported by the NHN only during the transition from the existing electronic mail systems to the X.400 mail system. Support for 3+ Mail to external users will be supported in accordance with Appendix A.

2.6.1.4 cc:MAIL

cc:Mail for internal use will be supported by the NHN only during the transition from the existing electronic mail systems to the X.400 mail system. Support for external cc:Mail connectivity will be supported in accordance with Appendix A.

2.6.1.5 DIRECTORY SERVICES

In accordance with Appendix A, the NHN will migrate from any proprietary directory services to the X.500.

Enclosure (2)

2.6.1.6 X-WINDOWS SERVER

X-Windows/Motif will be made available to every internal client to the NHN. The X-Windows/Motif capability will use the TCP/IP, DECNet, Appletalk and OSI protocols. The support for proprietary protocols will be transitioned in favor of the OSI protocol as practical.

2.6.1.7 VIRTUAL TERMINAL (VT) EMULATION

VT services will be provided from every internal client to the NHN and support to external VT sessions to any of the NHN hosts.

2.6.1.8 FILE TRANSFER PROTOCOL (FTP)

FTP over TCP/IP will be provided by each of the NHN file servers. A select number of NHN clients will also have the capability to perform FTP over TCP/IP. Generally speaking, peer-to-peer FTP access will not be supported by every node on the NHN.

2.6.1.9 TELNET SERVICES

TELNET terminal services will be provided by each of the NHN hosts. A select number of NHN clients will also have the capability to perform TELNET over TCP/IP.

2.6.1.10 NETWORK FILE SERVICES (NFS)

NFS will be provided by each of the NHN file servers. The intention is to provide seamless access to shared data from a variety of workstation platforms including those which use NFS exclusively for file sharing.

2.6.1.11 BERKELEY INTERNET DOMAIN (BIND) SERVICES

The NHN currently maintains a BIND server at IP address *192.58.199.37*. The domain name is *NAVAIR.NAVY.MIL*. The BIND server will be used by TCP/IP based network nodes which need name to IP address resolution.

2.6.1.12 FILE TRANSFER ACCESS MANAGEMENT (FTAM)

FTAM will be supported by every file server and host used by the NHN. Client support for FTAM will be accomplished in accordance with Appendix A.

2.6.1.13 REMOTE EXECUTIVE (REXEC) AND REMOTE SHELL (RSH)

REXEC and RSH services will be provided by the NHN network servers to facilitate the introduction of UNIX-based clients into the NHN. It is the intention of AIR-714 to provide this service as a migration tool for internal customers until OSI applications (X.400, UAs, etc.) become available for the UNIX platforms currently in-use at the TEAM.

2.7 DOCUMENT FORMATS

Users of the NHN will accept several different types of document formats. In most cases, the document format is transparent to the user. To ensure compatibility with all NHN users, only the following document types will be accepted by the NHN:

2.7.1 OPEN DOCUMENT ARCHITECTURE (ODA)

The ODA is an evolving standard developed by the ISO to facilitate interchange of documents. It will be supported by the NHN as the standard evolves.

2.7.2 MICROSOFT WORD

Microsoft Word for DOS, Windows and Macintosh formats will be supported by the NHN.

2.7.3 WORDPERFECT

Wordperfect for DOS, Windows and Macintosh formats will be supported by the NHN.

2.7.4 MICROSOFT EXCEL

Microsoft EXCEL spreadsheet formats for Windows and Macintosh will be supported by the NHN.

2.7.5 LOTUS 1-2-3

Lotus 1-2-3 spreadsheet formats for DOS, Windows and Macintosh formats will be supported by the NHN.

2.7.6 HARVARD GRAPHICS

Harvard Graphics presentation graphics formats will be supported by the NHN.

2.7.7 MICROSOFT POWERPOINT

Microsoft Powerpoint presentation graphics formats will be supported by the NHN.

2.8 DATABASE ACCESS

The NHN will support database access via ANSI SQL over DECNet, TCP/IP and OSI transports. The NHN currently employs the Oracle product as the primary database engine. All data formats for enterprise use (defined as any data element which may potentially be used out of the local environment) will be controlled by a central, corporate data dictionary under the administration of AIR-7144 and guidance which will be published under separate instruction.

Appendix A

NHN EXTERNAL INTERFACE SCHEDULE

Appendix B

NAST DECNET ADDRESS ASSIGNMENTS

NAST DECNet Address Assignments

Area Number	Site Name
1	Bell
2	Pentagon OP-05
3	NAVSEA
4	
5	
6	
7	NAWC-AD Indy
8	NAWC-WD Pt. Mugu
9	
10	
11	
12	
13	
14	
15	JAX Orange Park
16	JAX CODE 06
17	JAX
18	JAX PSD Cluster
19	JAX NADEP Cluster
20	JAX Publications
21	JAX Code 340
22	JAX TIFF
23	NAWC-AD Lakehurst
24	NAWC-AD Lakehurst
25	NAWC-AD Lakehurst
26	
27	
28	
29	
30	
31	
32	
33	
34	Boeing
35	NAWC-AD Patuxent River
36	NAWC-AD Patuxent River
37	NAWC-AD Patuxent River
38	NAWC-AD Patuxent River
39	Bell
40	NAWC-WD China Lake
41	NAWC-WD China Lake
42	NAWC-WD China Lake
43	NAWC-WD China Lake
44	NAWC-WD-China Lake
45	NADEP ALAMEDA
46	NADEP NORTH ISLAND
47	
48	
49	
50	
51	NAWC-AD Lakehurst
52	NAWC-AD INDY
53	NAWC-AD INDY
54	
55	
56	
57	NAVAIR-HQ
58	NAVAIR-HQ
59	NAVAIR-HQ
60	HAVAIR-HQ
61	NAVAIR-HQ
62	NAVAIR-HQ
63	NAVAIR-HQ

Appendix C

NAVWAN APPLETALK ZONE ASSIGNMENTS

NAVWAN APPLETALK ZONE ASSIGNMENTS

Site Name	Zone Name Prefix	Network Range
China Lake	NAWCWD_CL	0001 - 1999
Point Mugu	NAWCWD_PM	4000-5999
White Sands	NAWCWD_WS	8000-9999
NWEF Albuquerque	NAWCWD_NWEF	12000-13999
NAVAIR Headquarters	NAVAIRHQ	20000-21999
NAWC-AD Patuxent River	NAWCAD_PAX	24000-25999